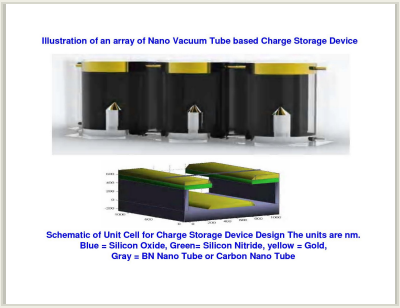
Small Business Innovation Research/Small Business Tech Transfer

Innovative High Energy Density Storage in Nano Vacuum Tubes (NVTs) Designed for Small Leakage Curren, Phase I

Completed Technology Project (2016 - 2017)

Project Introduction

NASA's various Space Mission Directorate seek to develop technology to fulfill the technology gap and to enable missions with the unique high energy density charge storage technology. The overall goal of this STTR proposal is attempt to develop the novel energy storage technology to enable and enhance the capabilities of future NASA missions. The unique set of requirements for the power systems for various missions have emerged and they vary greatly, with advancements in components needed above the current State of the Art for high energy density, high power density, long life, high reliability, low mass/volume, radiation tolerance, and the wide temperature operation. For this STTR our first goal is evaluation of the concept of Nano Vacuum Tube (NVT) based charge storage device design that can provide High Energy Density storage with significant mass savings. The feasibility evaluation of design approaches are suggested to meet the desired special needs of charge storage in space. As a second goal, it plans to leverage IR&D done at UIUC and AMSENG to bring together unique experience base team to undertake the feasibility study to fulfill the identified technology gap through prototype development. Although the theory developed at UIUC predicts that storage of GJ/m3 charges is feasible in Nano Vacuum Tubes, the proposed experiments will decide what is feasible and which design options delivers the performance in space, when one uses the space stable heritage light weight materials. Finally, the suggested material designs and the devices need to meet reliability needs of the space mission environment for a typical ten year mission lifetime and conform to the mission space qualification needs and the requirements including high vacuum, microgravity, radiation, atomic oxygen, low out gassing, and high launch loads. The phase I - feasibility evaluation and the phase II - validation efforts suggested herewith can help us to fulfill the technology gap



Innovative High Energy Density Storage in Nano Vacuum Tubes (NVTs) designed for Small Leakage Current with Enhanced Coulomb Blockade in Nano Gaps, Phase I

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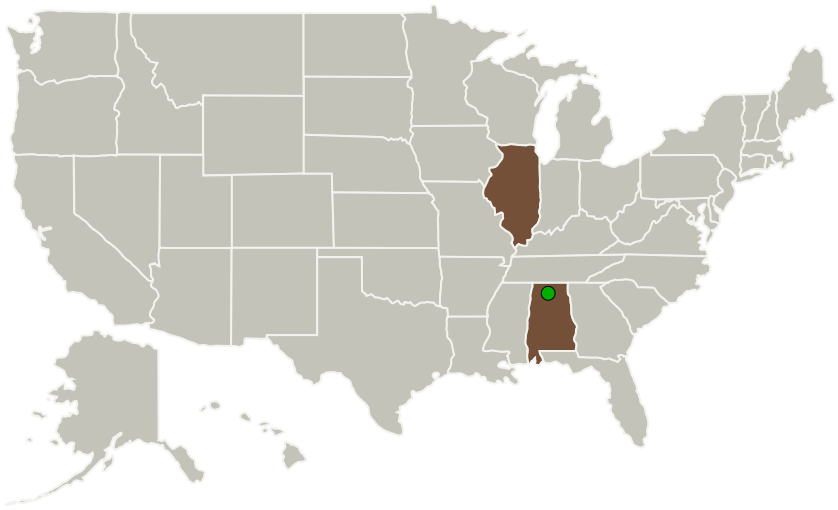
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Applied Material Systems Engineering, Inc. (AMSENG)	Lead Organization	Industry Small Disadvantaged Business (SDB)	Schaumburg, Illinois
Board of Trustees of the University of Illinois	Supporting Organization	Academia	Champaign, Illinois
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Illinois

Project Transitions

June 2016: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Material Systems Engineering, Inc. (AMSENG)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

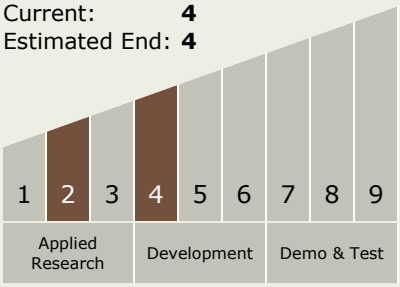
Carlos Torrez

Principal Investigator:

Alfred Hubler

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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June 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140410)*

Images

Briefing Chart Image
Innovative High Energy Density Storage in Nano Vacuum Tubes (NVTs) designed for Small Leakage Current with Enhanced Coulomb Blockade in Nano Gaps, Phase I *(https://techport.nasa.gov/image/130918)*

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.3 Advanced Concepts for Energy Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System